

CAMPUS PLASMAMED – FROM BASIC RESEARCH TO CLINICAL PROOF

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Plasma medicine is emerging worldwide and some promising applications seem to be near the horizon. However, a lot of basic research needs to be done to minimize risk and provide a scientific fundament for medical therapies. Despite several highly efficient antiseptics are commercially available, antiseptics of chronic wounds still remains a problem. In case of damaged skin or scar tissue, antiseptics do not penetrate efficiently enough into the tissue and can inhibit the wound healing process. A comprehensive risk-benefit assessment was realized in the Campus PlasmaMed using several in vitro and semi-in vivo models: 2D cell cultures; 3D epidermis model; fresh enucleated beef cattle eye; HET-CAM test (Hen's Egg Test Chorionallantoic Membrane). Clear advantages of different atmospheric pressure sources are demonstrated: significant higher antiseptic effects; promotion of blood circulation and angiogenesis; wound tissue tolerance; no decrease of antioxidative potential in human tissue; effective inactivation of biofilms. Therewith, plasma should be feasible for several medical applications: prevention and treatment of diseases (chronic wounds, skin and mucosal infections, localized tumors, keloid formation, promotion of angiogenesis, tissue ablation, hemostasis); inhibition of biofilm formation and direct action on biofilms; promotion of incorporation of implants into viable tissue by surface optimization (hydrophobicity, generation of antimicrobial active layers with drug delivery function); promotion of topical drug application by improved tissue penetration; several veterinary indications; treatment of dental diseases (peridontitis, peri-implantitis, prosthesis stomatitis root canal infections); improved medical device reprocessing. Present studies in the Campus PlasmaMed are focused on verification of a selective antiseptic effects of various plasma sources, i.e. the inactivation of infectious micro-organisms on living tissue without damaging side effects. Second step is to investigate plasma-based stimulation of cell proliferation and tissue regeneration to establish a scientific basis for subsequent systematic clinical studies. The aim of all this work is to develop Tissue Tolerable Plasma (TTP) based devices as well as reproducible application processes and guidelines for effective wound antiseptics including stimulation of wound healing.

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